



High Resolution Analysis Products to Support Severe Weather and Cloud-to-Ground Lightning Threat Assessments over Florida

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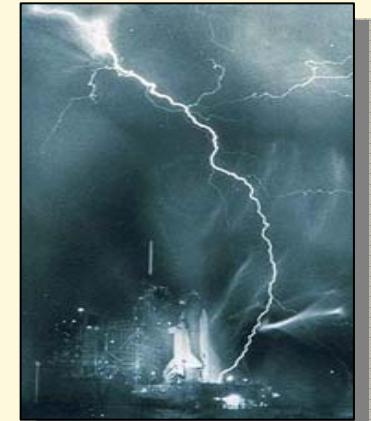
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Presentation Outline



- Description of operational high-resolution analyses at NWS Melbourne, FL (NWS MLB)
- Implementation of additional diagnostics
 - Severe weather products
 - Supercell Composite Parameter (SCP)
 - Significant Tornado Parameter (STP)
 - Cloud-to-ground lightning initiation signatures
 - Sounding + reflectivity information
 - Four reflectivity / temperature levels
- Sample results





Operational Analyses at NWS MLB



- Configuration of ARPS Data Analysis System (ADAS)
 - Analysis software from University of OK, similar to LAPS
 - Integrates all available data over FL peninsula
 - 40-km RUC: background field for analysis
 - Level II WSR-88D, satellite IR/VIS, sfc obs, mesonet, etc.
 - Objectively analyzed onto grids using a Linux workstation
 - Run at high temporal (15 min) and spatial resolution (4 km)
 - Visualization, Time Animation, & Diagnostics in AWIPS & web
 - www.srh.weather.gov/mlb/ldis/4km/ADAS_temperature.htm
- Result: More comprehensive understanding of evolving fine-scale weather features



Additional Products Implemented

- Supercell Composite Parameter (SCP)
 - Depict potential areas for supercell thunderstorms
 - Values > 1 → threat for supercell thunderstorms

$$SCP = \left(\frac{MUCAPE}{1000 \text{ J kg}^{-1}} \right) \times \left(\frac{BRN \text{ Shear}}{40 \text{ m}^2 \text{s}^{-2}} \right) \times \left(\frac{0 - 3 \text{ km SRH}}{100 \text{ m}^2 \text{s}^{-2}} \right)$$

- Significant Tornado Parameter (STP)
 - Identify areas favorable for supercells producing F2+ tornadoes
 - Values > 1 → threat for significant tornadic supercells

$$STP = \left(\frac{SBCAPE}{1500 \text{ J kg}^{-1}} \right) \times \left(\frac{0 - 6 \text{ km Shear}}{20 \text{ m s}^{-1}} \right) \times \left(\frac{0 - 1 \text{ km SRH}}{150 \text{ m}^2 \text{s}^{-2}} \right) \times \left(\frac{[2000 - SBLCL]}{1000 \text{ m}} \right)$$

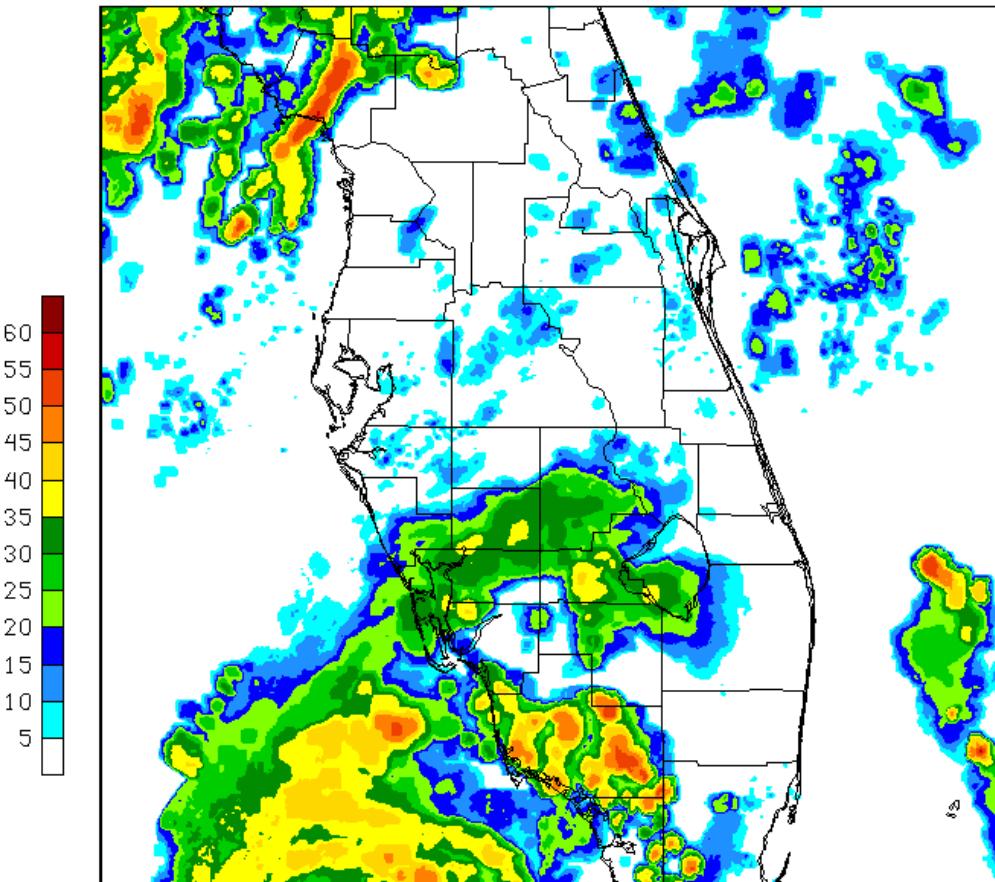
- Reference: Thompson *et al.* (2003), Weather and Forecasting



Hurricane Charley Example: 1-km Composite Reflectivity

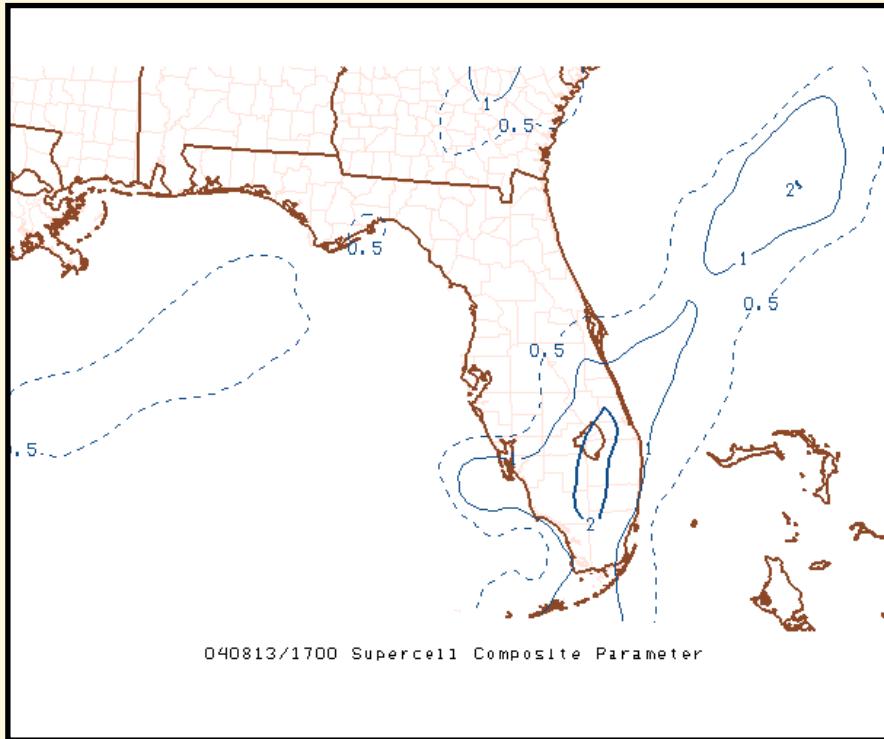


COMPOSITE REFLECTIVITY AT 040813/1400V000

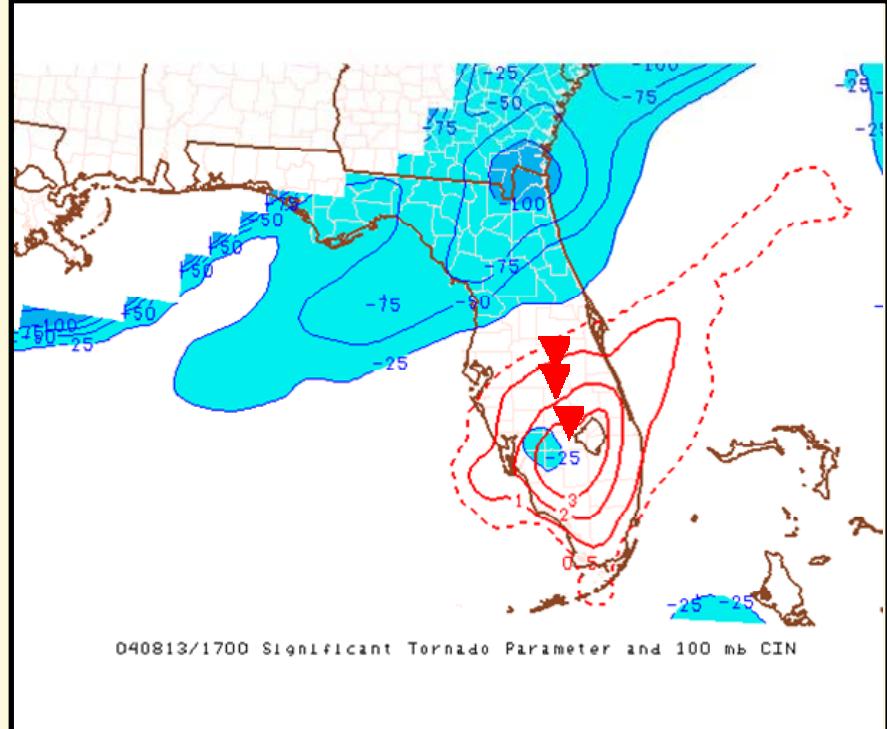




Hurricane Charley Example: Storm Prediction Center RUC Products*



SCP at 1700 UTC 13 AUG 2004



*Courtesy of Roger Edwards, Storm Prediction Center



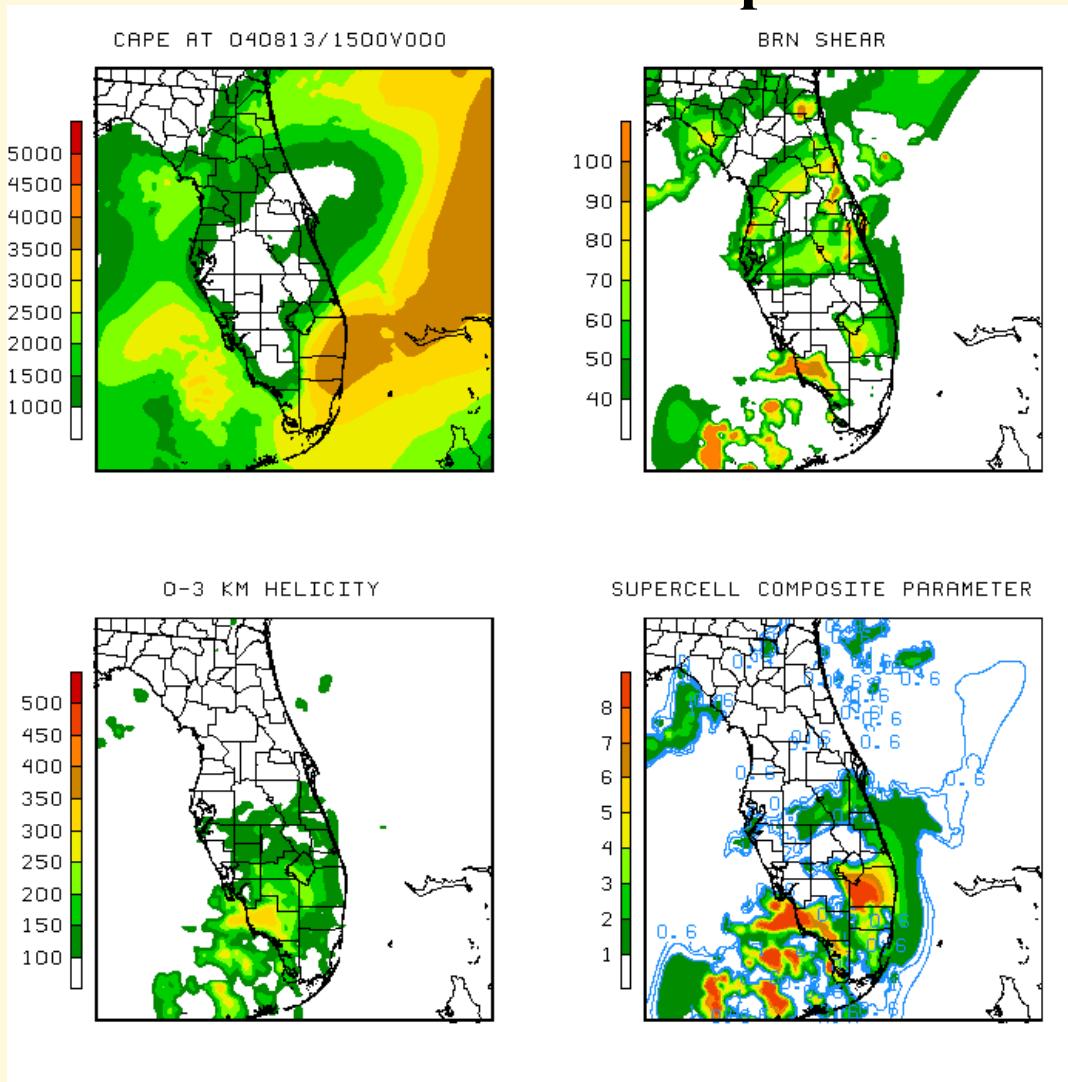
Hurricane Charley Example: 4-km ADAS SCP 4-panel



Chart Legend:

CAPE BRN_Shr

0-3SRH SCP





Hurricane Charley Example: 4-km ADAS STP 4-panel

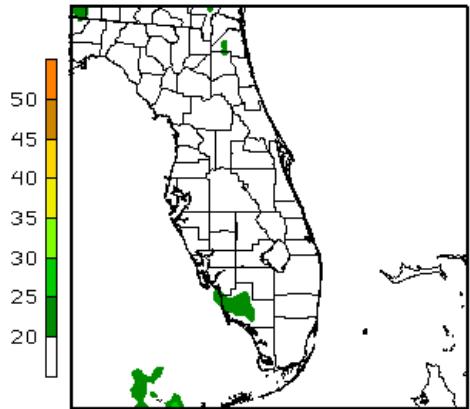


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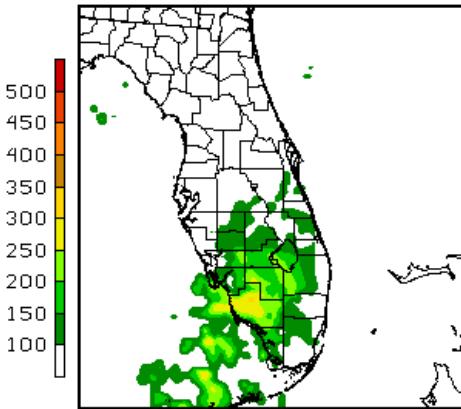
0-6Shr 0-1SRH

LCL STP

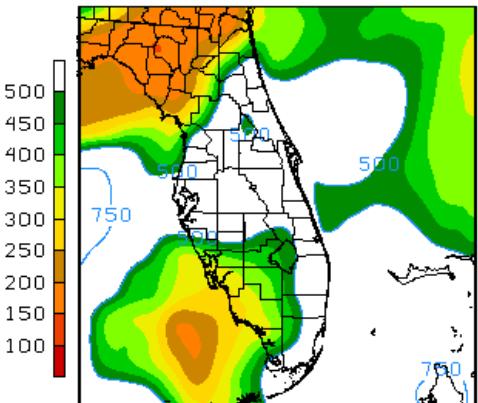
0-6 KM SHEAR AT 040813/1500V000



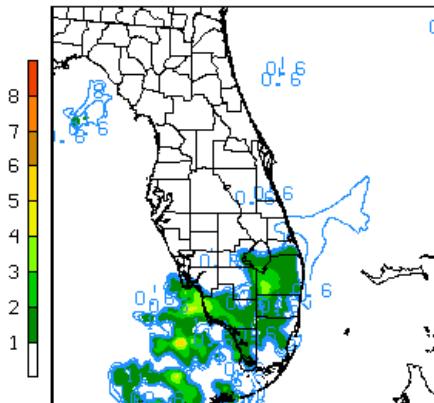
0-1 KM HELICITY



HEIGHT OF LCL (M)



SIGNIFICANT TORNADO PARAMETER





Additional Products Implemented



- Cloud-to-Ground Lightning Initiation Signatures
 - Based on Gremillion and Orville (1999) study over Kennedy Space Center, FL
 - Implemented 3 most skillful lightning initiation signatures
 - > 40 dBZ at -10°C [CSI of 79%, 7.5 min median lead time]
 - > 30 dBZ at -15°C [CSI of 71%, 12.5 min median lead time]
 - > 20 dBZ at -20°C [CSI of 63%, 10.5 min median lead time]
 - Created 4-panel web displays
 - Composite reflectivity
 - Most skillful reflectivity threshold values



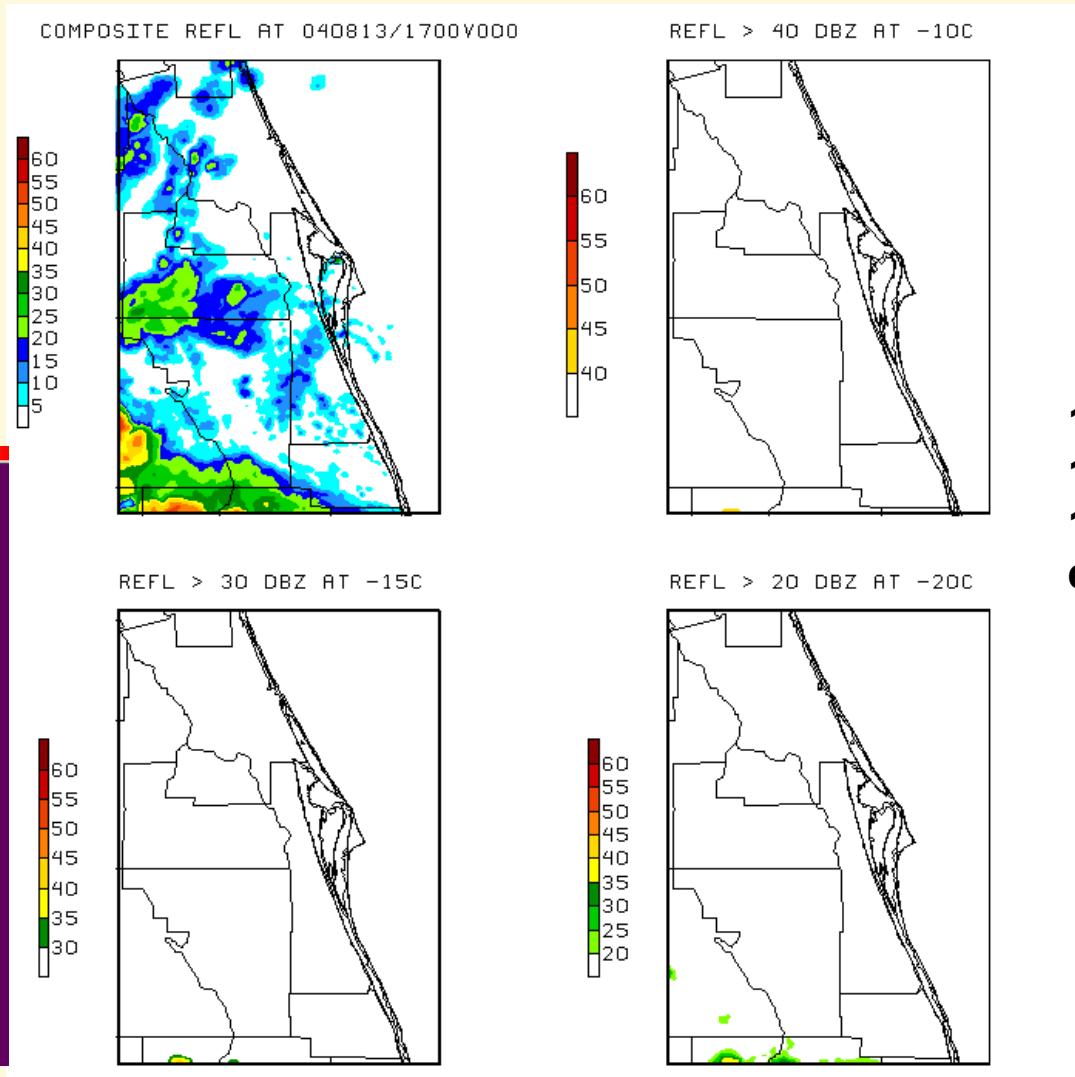
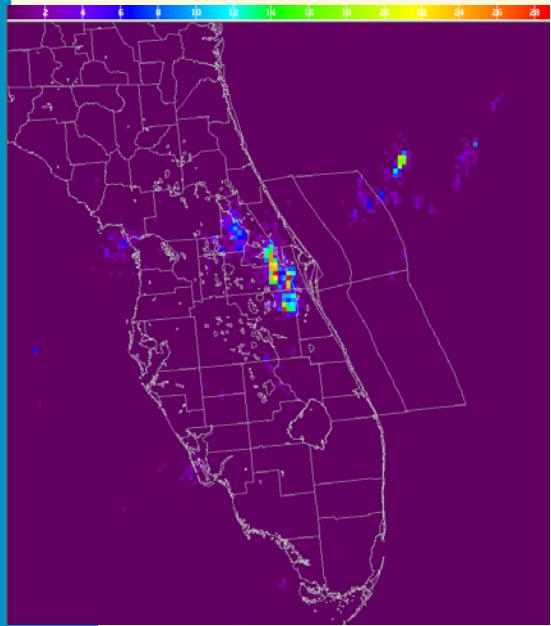
Hurricane Charley Example: 1-km ADAS 4-panel reflectivity



Reflectivity Plots Shown:

Comp >40@-10°
>30@-15° >20@-20°

Corresponding NLDN
CG lightning below



13 AUG 2004
1700 UTC to
1900 UTC,
every 5 min



Summary

- Operational ADAS at NWS Melbourne, FL
- New diagnostics recently made available
 - Supercell Composite Parameter
 - Significant Tornado Parameter
 - Gremillion CG Lightning Initiation Signatures
- Examples
 - 4-km operational Florida peninsula graphics
 - Prospective 1-km east-central Florida domain
- Questions?
- AMU Web page: <http://science.ksc.nasa.gov/amu>